

# Antimicrobial And Cytotoxic Effect of Selenium Nanoparticles Synthesized Using Clove and Cumin Formulation

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## ABSTRACT

**Aim:** The purpose of this study is to use clove and cumin extract to produce the selenium nanoparticles via green approach. Selenium nanoparticles synthesized using clove and cumin formulation nanotechnology explores a lot of interesting approaches in the field of biomedicine. Researchers have recently developed interest in biomolecule-mediated nanoparticle production because of its eco-friendly and non-toxic properties. Clove and cumin have long been used in traditional medicine to treat various illnesses.

**Materials And Method:** Collection of clove and cumin extract then 1 g of clove and cumin, powder was dissolved in distilled water and boiled for 5-10 min at 60-70C. The solutions were then filtered using Whatman No. 1 filter paper. The filtered extract was collected, synthesis of selenium nanoparticles using an herbal formulation, and to finalise the anti-inflammatory activity of selenium nanoparticles.

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## INTRODUCTION

Regardless of the socioeconomic status and geographic location of the population, diabetes mellitus has been a chronic worldwide health concern affecting humanity. (1) One of the most prevalent metabolic disorders, diabetes mellitus affects about 2.8 percent of the world's population and is expected to reach 5.4 percent by the year 2025 (2). Some medicinal plants have been employed empirically in antidiabetic and antihyperlipidemic therapies and have been reported to be helpful in diabetes across the globe (3). Many of the drugs that are currently on the market have either been directly or indirectly produced from plants, which have historically been a very good source of pharmaceuticals. According to ethnobotanical data, about 800 plants may be capable of preventing diabetes overall. (4) According to studies, *Momordica charanta*, *Pterocarpus marsapium*, and *Trigoella foenum* are effective for treating type 2 diabetes. Ponnusamy S, Ravindran R, Zinjarde S, Bhargava S, Kumar AR. (5) Evaluation of traditional Indian anti-diabetic medicinal plants for human pancreatic amylase inhibitory effect in vitro. Evidence Based Complement Alternat Med. (6)

In some tropical and subtropical regions of Asia, America, and Africa (6), the perennial herb lemongrass (*Cymbopogon citratus*), which has long, thin leaves, is one of the therapeutic plants that is most often cultivated. On a dry basis, it has a 1-2% essential oil content. (7) The genetic diversity, environment, and agronomic management of the culture all have a significant impact on the chemical makeup of lemongrass essential oil. Because citral is present, lemongrass leaves have that distinctive lemon flavour. In order to make ionone, vitamin A, and beta-carotene, citral, which is a blend of neural and geranial isomers, is used as a raw material. (8)

## KEYWORDS:

Antimicrobial,  
Cytotoxic,  
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Selenium nanoparticles have been gaining attention for their potential antimicrobial properties. Studies have shown that these nanoparticles can inhibit the growth of bacteria and fungi, making them a promising candidate for use in the food and medical fields<sup>12</sup>. Selenium nanoparticles can be synthesized using green methods, such as using plant extracts as reducing agents<sup>3</sup>. The unique properties of nanoparticles, such as their larger surface area, make them an attractive option for targeted delivery to specific sites<sup>3</sup>. Further research is needed to fully understand the potential of selenium nanoparticles as an antimicrobial agent.

The anti-oxidant, anti-microbial, and anti-fungal properties of lemon grass have been demonstrated by a number of research<sup>1</sup>. Citrus Cymbopogon Due to its use and spread, it is regarded as one of the most widely sourced plants worldwide. Different C. citratus preparations have demonstrated a range of pharmacological activities. Numerous benefits, including those against pathogens, inflammation, diabetes, and cancer, have been thoroughly documented (Lawal et al., 2017).

## MATERIALS AND METHODS

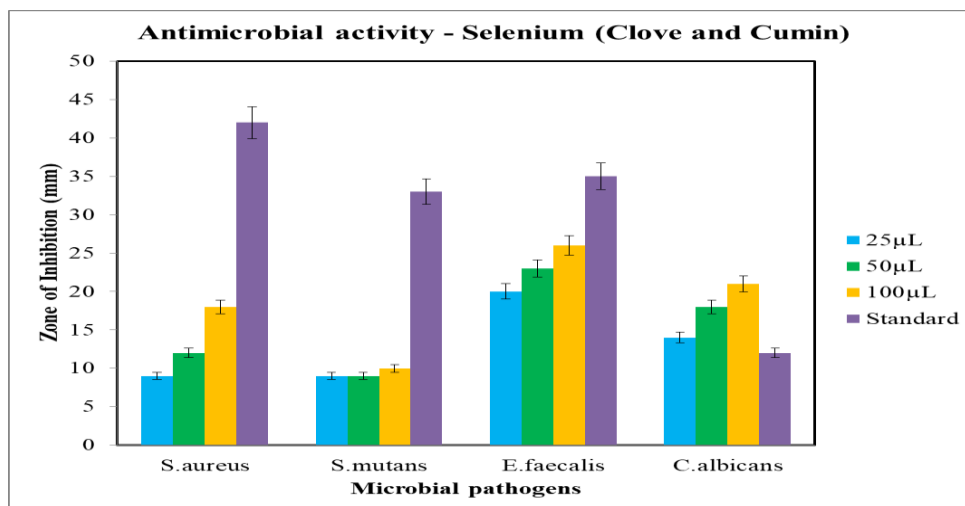
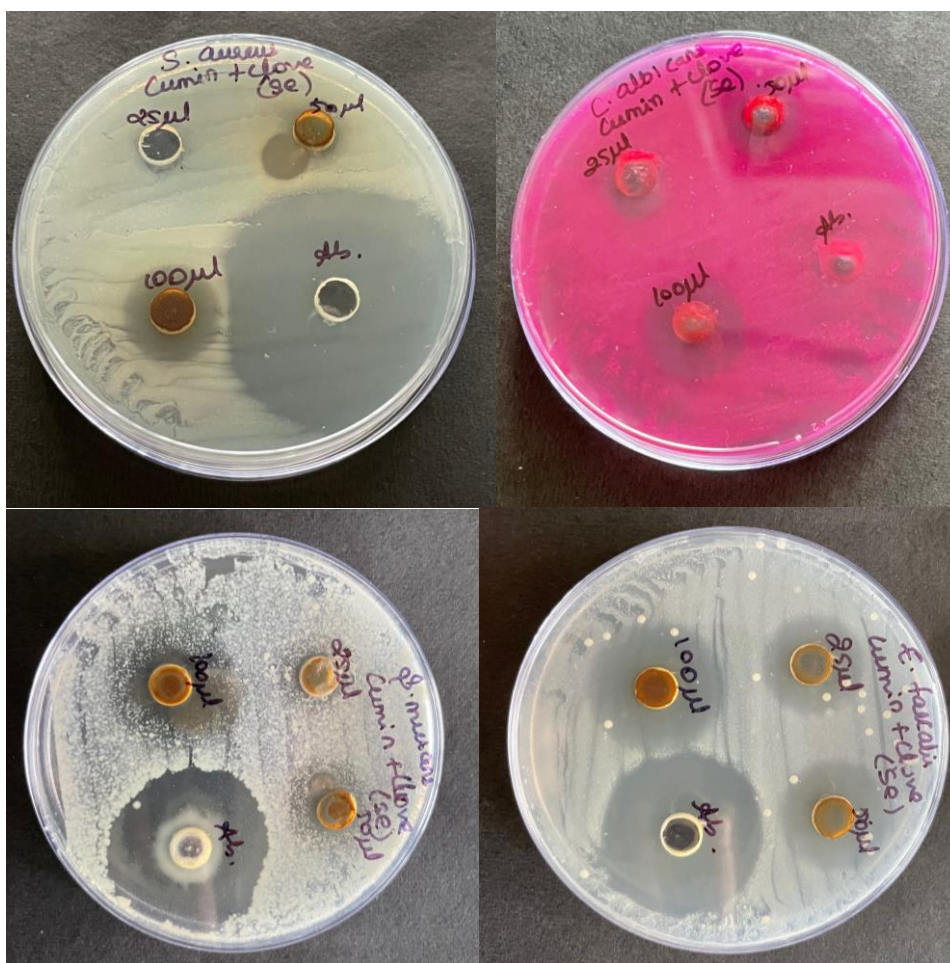
### Antidiabetic activity α-amylase inhibition assay

The inhibition of α-amylase was carried out by the method described by Malik and Singh [35]. Briefly, the reaction was initiated by the addition of 490, 470, and 450 uL buffer to different volumes (10, 30, and 50 ML) of 30 mg/mL of garlic extract, synthesized silver nanoparticles, stored (at room temperature, at 37°C and 4°C), and calcined (300°C, 500°C and 700°C) GAgNPs samples, respectively, to make the total volume of 500 uL reaction solution. In the next step, 500 ML α-amylase was added, followed by the addition of 1,000 ML of starch to the reaction vessels. Then, the reaction vessels were incubated in a water bath for 5 min at 100°C. Next to this step, 500 pL of NaOH is added. The reaction was completed by the addition of 500 ML of DNS, and then, the reaction vessels were again incubated for 5 min by putting them in a beaker with hot water. The color change from yellow to orange indicated α-amylase inhibition activity. For the preparation of blank, 30 ML of garlic extract was added into 1,500 ML buffer, and all the steps were conducted in the same sequence as mentioned earlier except the addition of amylase and starch. The tubes were left to cool, and the absorbance was measured at 540 nm. The percentage inhibition of α-amylase was calculated as  $[(A_o - A_i)/A_o] \times 100$ , where A<sub>o</sub> was the absorbance of the standard and A<sub>i</sub> was the absorbance of the test samples.



Figure 1: Preparation of nanoparticles

## RESULTS AND DISCUSSION



**Figure 2:** Antimicrobial activity of selenium nanoparticles

organism	25	50	100	Ab
<i>S. aureus</i>	9	12	18	42
<i>S. mutans</i>	9	9	10	33
<i>E. faecalis</i>	20	23	26	35
<i>C. albicans</i>	14	18	21	12



## DISCUSSION

Selenium nanoparticles synthesized using clove and cumin formulation nanotechnology explores a lot of interesting approaches in the field of biomedicine. Clove and cumin have long been used in traditional medicine to treat various illnesses. (14)The results of this study show that the combination of clove and cumin extract with selenium nanoparticles had a better percentage of inhibition by both Spectrophotometry analysis of antioxidant assay revealed that 50 µL of the herbal formulation with silver nanoparticles had the highest absorption percentage of about 93.15% .(15) whereas the anti-inflammatory assay revealed that 50 µL has absorption percentage of about 92.9% when compared to the reference standard (Amoxicillin).(10) In previous research work Morinda Citrifolia Leaf Mediated Selenium Nanoparticles shows the size of generated SeNPs in Morinda citrifolia was anticipated to be 12-160 nm based on TEM images.(11)The antioxidant activity of selenium NPs was discovered to be 66.7 to 83.7% of free radical.(12)

## CONCLUSION

It can thus be concluded that clove-cumin mediated selenium nanoparticles have the ability to be used as an effective cytotoxic and anti microbial . This formulation needs to be further purified to isolate the component in the extract that makes it effective to be used in large scale production for targeted drug delivery against a wide array of microbial infections.

### Ethical approval

NA

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### Conflict of interest

NA

### Informed Consent

None declared

### Authorship contribution

JV compiled the manuscript RKS conducted the study TL designed the study SG Performed Proof reading of the Manuscript

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